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Climate change and the Thames Estuary

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Critical research findings that will help plan future flood risk in the Thames Estuary are revealed today as part of the Environment Agency's Thames Estuary 2100 Project — a project that considers an adaptive approach for planning for future flood risk in the Estuary.

The results, released today at the international conference *Climate change impacts and adaptation: Dangerous rates of change* at Exeter University, confirm that current Government predictions and previous flood scenarios are realistic and have gone a long way to reducing the uncertainty around maximum water levels.

The key findings from this new research are as follows.

- Sea-level rise in the Thames over the next century due to thermal expansion of the oceans, melting glaciers and polar ice is likely to be between 20 cm and 90 cm.
- There remains much uncertainty over the contribution of polar ice melt to increasing sea-level rise. At the extreme, it may cause sea level to rise by a total of up to 2 metres (including thermal expansion).
- Climate change is less likely to increase storm surge height and frequency in the North Sea than previously thought.
- Future peak freshwater flows for the Thames, at Kingston for instance, could increase by around 40% by 2080.

Crucially, in terms of the Thames estuary, this research means that:

- current Government predictions for sea-level rise in the Thames Estuary are realistic;
- the Environment Agency's Thames Estuary 2100 project is using the best available climate-change science to plan with confidence for future flood management on the Thames Estuary;
- previous worst-case scenario of increases in maximum water levels can be revised down from 4.2 metres to 2.7 metres. Such a reduction in worst-case scenario for this century means that a tide-excluding estuary barrage is unlikely to be necessary to manage flood risk this century.

Speaking about the results, Dr Jason Lowe, Head of Mitigation at the Met Office, said: "Having greater clarity on things such as storm-surge frequency is tremendously valuable and not just from a scientific point of view. This research will help to direct investment where it is most needed to manage the impacts of climate change."

Tim Reeder, Regional Climate Change Programme Manager for the Environment Agency Thames Region said: "This research enables the Environment Agency to continue to plan flood management investment with confidence. By narrowing previous uncertainty we now have an improved understanding of how climate change will affect the Thames Estuary and can develop realistic and cost-effective options, which will meet future needs. These are cutting-edge results and demonstrate the value of the Government engaging with the world-class scientists we have here in the UK."

The Environment Agency commissioned climate scientists from the Met Office Hadley Centre, the Proudman Oceanographic Laboratory and the Centre for Ecology and Hydrology to investigate what impact climate change will have on the area over the next 100 years.

The study was commissioned to reduce climate change uncertainties, in particular the future frequency and height of North Sea storm surges on the Thames Estuary. In addition, the group answered other key questions to assist the Environment Agency to plan future flood-management investment with confidence.

- By how much the thermal expansion of the oceans as they warm would increase sea levels in the Thames Estuary?
- By how much sea levels in the estuary might rise due to polar ice melt?
- By how much freshwater flows in the Thames are likely to increase?

Notes to Editors:

Sea-level rise
The maximum **likely** contribution of sea level rise is broadly the same as the guidance given by Defra in 2006 (0.94 metres by 2100). This means previous assumptions on sea-level rise based upon Defra guidance are realistic. (Note: these figures include changes in land levels.

Polar ice melt
The potential for sea-level rise to be further increased by polar ice melt was factored in to the original worst-case scenario of 4.2 metres maximum water levels. This had taken an extremely precautionary approach for worst-case ice cap melt. The increase of 2 metres (including thermal expansion) from this study can now be taken as the contribution of sea-level rise in a revised worst case scenario, using more recent, albeit still highly uncertain ice sheet dynamics science.

Storm surge
The EA also factored an increase in maximum water levels due to increased heights of storm surge into previous worst-case planning scenarios. The results of these studies suggest that it is unlikely that we will see an increase in maximum water levels through this source.

Worst-case scenario
The TE2100 worst-case scenario for increases in maximum water levels in the Thames this century is now revised down to 2.7 metres including surge. Although the research suggests that storm surges are less likely to contribute to any increase in maximum water levels, a precautionary extreme value of 0.7 metres is included.

This worst-case scenario is highly unlikely to occur as is it is derived from a combination of extreme values for thermal expansion, polar ice melt, and storm surge. Further research is needed to try and understand the probability of all these extremes occurring, but this study allows us to understand the maximum levels that could plausibly happen, and therefore set the outer range for planning for the future.

Estuary responses to managing water levels
Under the previous worst-case scenario, which was accepted as very unlikely, the only option available to manage maximum water levels by the end of the century was an estuary barrage. With the revised assessment (again very unlikely) it should be possible to manage water levels through other more-sustainable means without resorting to a tide-excluding barrage.

Freshwater flows
Previous planning was based on a 20% increase in river flows over the century based on UKCIP02. As a result, flood management options will be sensitivity tested against the potential increase to 40%. The contribution of freshwater flow to flood risk is low apart from in the western reaches of the estuary, where there is less tidal influence.

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